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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/716,950	11/19/2003	Young Hoon Park	YPL-0069	7281

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CANTOR COLBURN, LLP
55 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

EXAMINER

STOUFFER, KELLY M

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 08/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/716,950

Applicant(s)

PARK ET AL.

Examiner

Kelly Stouffer

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 November 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 November 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 7 March 2005.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: V16 in Figure 1. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:

On page 8 line 16 Figure 14 should be —Figure 4—

Pages 6-8 should mention that the Figure described in detail is Figure 2.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Application Publication number 2003/0003635 A1 to Paranjpe et al. Paranjpe et al. includes a method of depositing an aluminum oxide thin film on a wafer by atomic layer desorption (ALD) in paragraph 0009 lines 1- 5 in a chamber that contains a reactor block for the substrate or wafer block shown as heated chuck 204 in Figure 2. A top lid and showerhead with a plurality of holes to deposit two different reactant gases is shown as multi-zone showerhead 203 in Figure 2 and contains showerhead zones 203A and 203B described in paragraph 0036 lines 5-13. The chamber 201 in Figure 2 is pumped down to 10^{-6} torr as described in paragraph 0035 lines 18-19, confirming that the multi-zone showerhead 203 in Figure 2 indeed acts as a top lid to maintain a predetermined pressure within the reaction vessel. The wafer or substrate 101 in Figure 1 is mounted on a reaction block or heated chuck 204 and is heated to a temperature of 60-350 °C as described in paragraph 0031 lines 5-6. An aluminum oxide film is deposited by ALD as described in paragraph 0009 et seq, and another embodiment is disclosed in paragraph 0033 et seq. With regard to the embodiment in paragraph 0033, an oxidant (ozone as mentioned in paragraph 0032 line 6) is deposited on a film using a carrier gas from showerhead zone 203 B in paragraph 0036 et seq. The process chamber is purged with a high flow of inert gas out of the same showerhead zone by vacuum purging due to the presence of turbo molecular pump 220 in Figure 2 then is dosed with a precursor (trimethylaluminum in paragraph 0030 lines 3-

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4 that is at room temperature in a canister or trimethylaluminum source 215 in Figure 2 as described in paragraph 0036 lines 1-2) transported by a carrier gas from showerhead zone 203 A in paragraph 0036 et seq. The chamber is purged once more with inert gas through the same showerhead zone by vacuum purging due to the presence of turbo molecular pump 220 in Figure 2. The process may be repeated to achieve desired film thickness in paragraph 0033 lines 19-21. Paranjpe et al. does not include spraying an inert gas through showerhead zone 203 A while the ozone is sprayed through 203 B nor does Paranjpe et al. include spraying an inert gas through showerhead zone 203 B while TMA is sprayed through 203 A. Paranjpe et al. teaches that care should be taken to ensure that precursor and oxidant never co-flow into the chamber, a common delivery line such as showerhead zones 203 A or 203 B, or into an exhaust line in order to prevent alumina powder formation as described in paragraph 0041 lines 7-14. In order to prevent alumina powder formation in a common delivery line such as showerhead zones 203 A or 203 B one of ordinary skill in the art would realize the importance of avoiding cross-contamination of the showerhead zones by oxidant and reactant. If inert gas were not flowing through the second showerhead zone while the first was depositing either oxidant or reactant, the second showerhead zone would become contaminated by the oxidant or reactant flowing out of the first. Therefore, in order to prevent cross-contamination of the showerhead zones and delivery lines as required by Paranjpe et al., one of ordinary skill in the art would deduce that inert gas must be flowing out of a showerhead zone while the other showerhead zone is spraying oxidant or reactant.

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It would have been obvious to one of ordinary skill in the art at the time of invention to modify Paranjpe et al. to explicitly include flowing inert gas out of one showerhead zone while the other was being used to spray oxidant or reactant in order to prevent co-flow of oxidant and reactant into the delivery system and consequent formation of alumina powder on the showerhead.

Paranjpe et al. does not include values for the flow rates or duration of exposure of the ozone, carrier, purge, and TMA gases. Nor does Paranjpe et al. include the concentration of the ozone gas, which would also depend upon pressure and flow rate, and Paranjpe et al. gives the capacity of the TMA container as 35 psig which is about $48 \text{ cm}^3/\text{mol}$, resulting in a conceivable range of $500\text{-}3000 \text{ cm}^3$ depending on the number of moles of TMA. Paranjpe et al. teaches in paragraph 0031 et seq. that the values of flow rates and duration for each step of the ALD process depend upon the apparatus and conditions employed in the invention and their importance is only to achieve a desired aluminum oxide film quality. The values of flow rates and duration for each step are therefore result-effective and are not inventive.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify Paranjpe et al. to include values of flow rates for ozone, carrier, purge and TMA gas to be in the range of $50\text{-}1000 \text{ sccm}$ with an ozone concentration of at least 100 g/cm and to include the duration of the steps to be within $0.1\text{-}4$ seconds or $0.1\text{-}3$ seconds depending on the ozone or TMA step, respectively, absent any criticality for utilizing the claimed values in order to achieve a desired aluminum oxide film quality.

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Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kim et al. shows a similar apparatus and procedure

Park et al. shows a similar apparatus and procedure

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
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TIMOTHY MEKS
SUPERVISORY PATENT EXAMINER

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